



A WATER UTILITY'S PERSPECTIVE

*PLANNING FOR HARMFUL ALGAL BLOOM
EVENTS ON THE KANSAS RIVER*

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WATERONE – 03/28/19*

WaterOne
Water District No. 1 of Johnson County

WHO IS WATERONE?

- Quasi-municipal government
- Similar to a City Government
- Sole purpose is drinking water supply
- Seven member elected board
- Serve most of Johnson County
 - 17 Cities
 - 272 Square Miles
 - 425,000+ customers
 - Produce up to 200 MGD



SUMMER 2011: TOO CLOSE TO HOME

- Harmful Algal Bloom (HAB) on Milford Lake closes it to recreation
- Large releases from Milford raise concern for toxins on the Kansas River
- USGS monitors Kansas River
 - Microcystin detected at water intakes near World Health Organization (WHO) Guidance Levels of 1 ug/l
- WaterOne switches its source water
 - Kansas River to Missouri River
- No Microcystin detected in tap samples



2012: PROACTIVE RESEARCH, TESTING

- Initiated two projects
 - *Funded by Kansas Water Office, WaterOne, and cities of Olathe, Lawrence, and Topeka*
 - 1. **USGS study of the Kansas River (2012-2017)**
 - Correlate water quality parameters to microcystin
 - Background sampling, escalates in an event
 - 2. **Water Research Foundation (WRF) Study #4526**
 - Treatment effectiveness in removing microcystin
- WaterOne Lab initiates ELISA Microcystin test on raw and tap samples

2014: NATIONAL CONCERNS

- Lake Erie experiences large scale Algal Bloom
- Toledo, OH detects Microcystin in Tap >1.0 ug/l
- Toledo issues “DO NOT DRINK” notice to customers
- EPA pressed by Congress to establish guidance



2015: EPA RECOMMENDATIONS

- EPA issues initial health advisory values for microcystin and cylindrospermopsin based on acute exposure
- Algal Toxins-Health Advisory Levels - 10 day average exposure

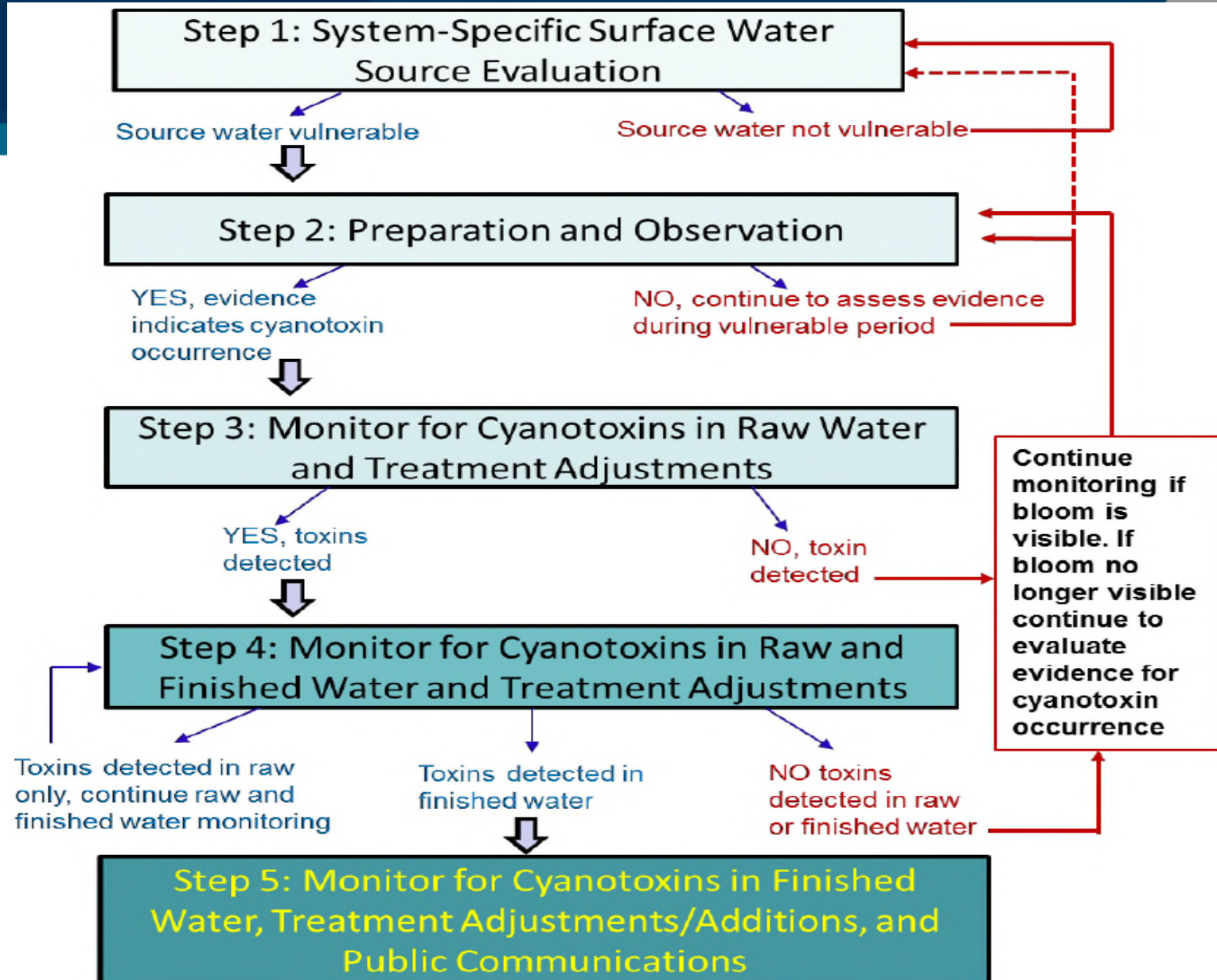
	Bottle-fed infants and pre-school kids	School-age kids and adults
Microcystins	0.3 ug/L	1.6 ug/L
Cylindrospermopsin	0.7 ug/L	3.0 ug/L

REACTING TO EPA RECOMMENDATIONS

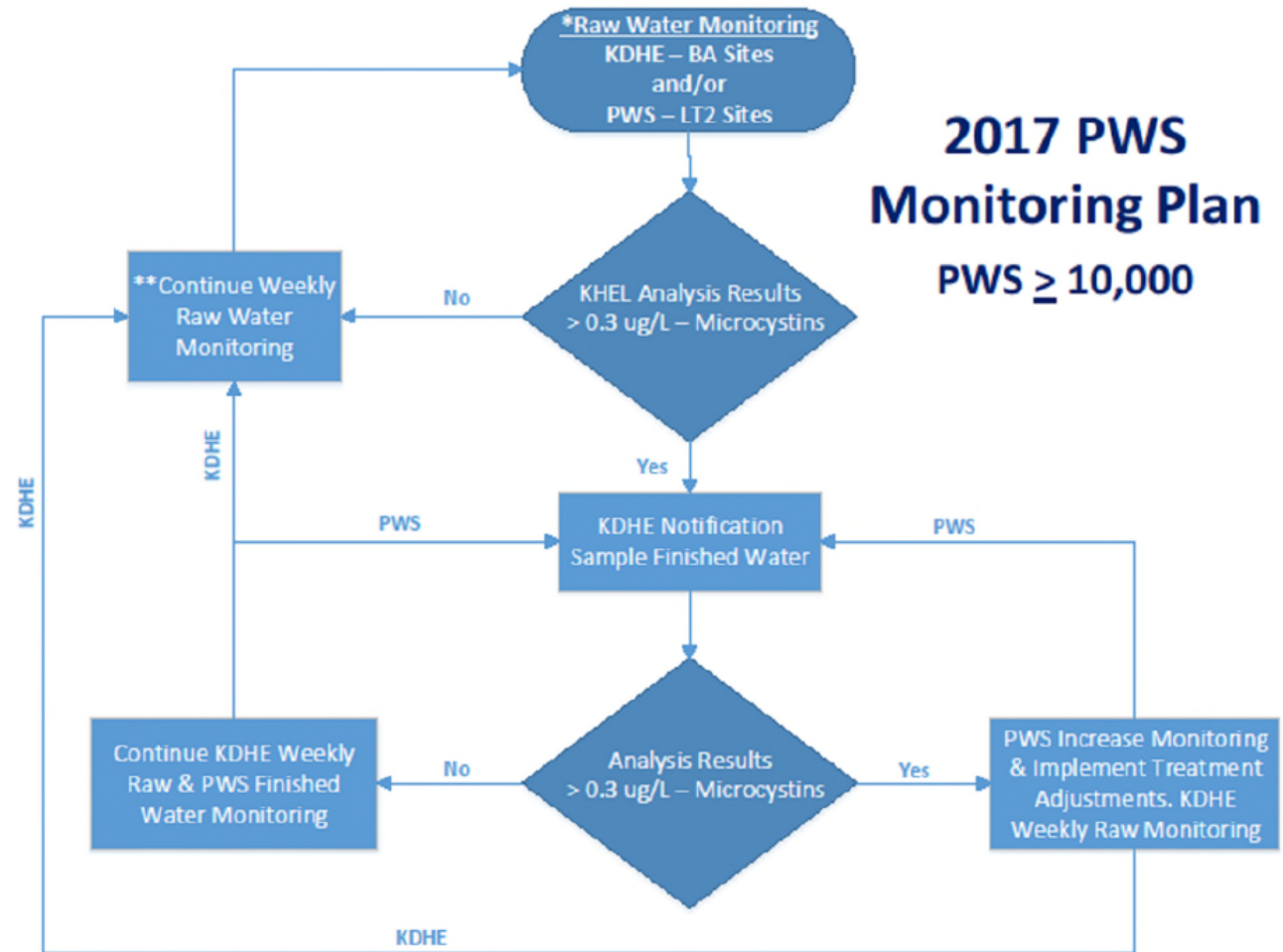
- WaterOne staff met with KDHE, discussed EPA recommendations
- Created detailed response plans:
 - Lab
 - Treatment Plant
 - Customer Relations



EPA'S GUIDANCE



KDHE HARMFUL ALGAL BLOOM RESPONSE PLAN



*Raw Water Monitoring Triggered by Reported Bloom

**If Microcystins <4 ug/L and Cell Count < 80,000, BA Sites not Sampled
If Microcystins ≥ 0.3 ug/L and <4.0 ug/L, PWS Sample LT2 Sites

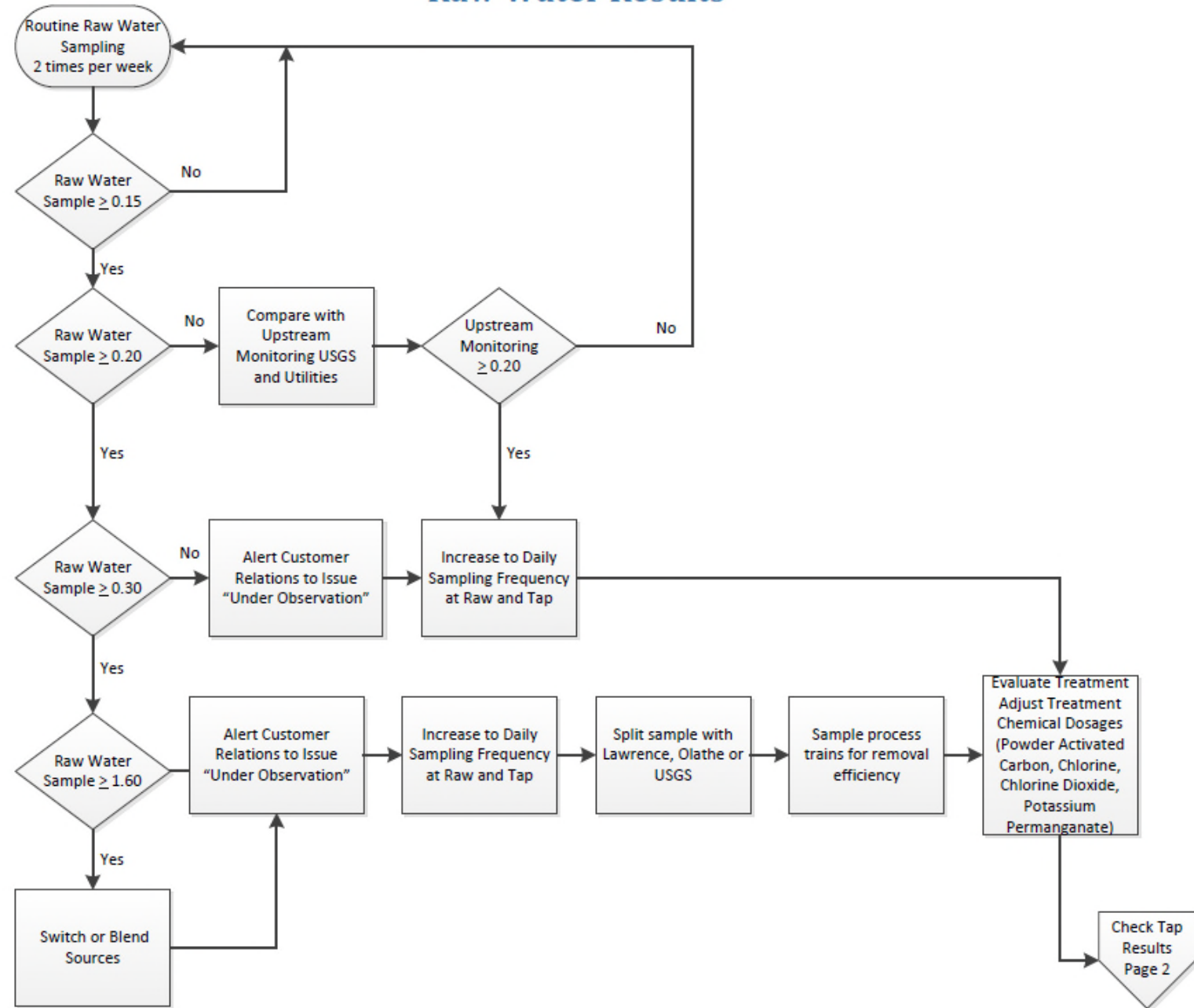
WATERONE EMERGENCY OPERATION PLAN



- Water Supply Contamination
- Water Rationing
- Regulatory Requirement for Public Notification
- Immediate Public Notification Wording
- Use established communication network with the local public health and medical community
- Cyanotoxin Management Section

Cyanobacteria Sampling

Raw Water Results



LABORATORY RESPONSE

- Monitor source water 2x/week using ELISA Screening Test
- If source water detection:
 - Adjust sample schedule
 - Monitor treatment removal for operations
 - Notify Customer Relations
- Split samples and share test results with other Public Water Suppliers
- Use outside contract labs for confirming tests using LC/MS



NOAA HAB SCREENING

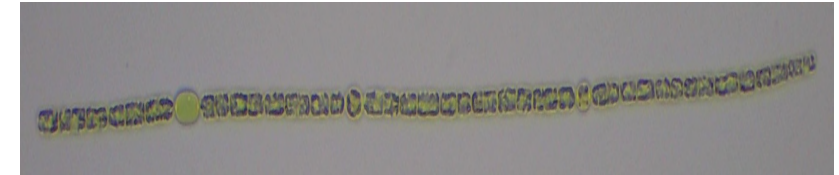
Weekly microscopic examination for identification of:

- Aphanizomenon
- Dolichospermum
- Cylindrospermopsis
- Planktothrix
- Microcystis

Planktothrix



Aphanizomenon



FUTURE LABORATORY SCREENING

Phytoxigene CyanoDTec

- Assay measure gene copies rather than toxin
- Non species dependent
- Predictive
- Faster
- Comparison studies completed by EPA

TREATMENT PLANT RESPONSE

- Change water sources from Kansas River to Missouri River and Wolcott Treatment Plant
- Adjust treatment and chemicals at the plant
 - carbon, potassium permanganate, chlorine
- Continue to adjust based on results of sampling and monitoring
- Notify Customer Relations and Laboratory of results and actions



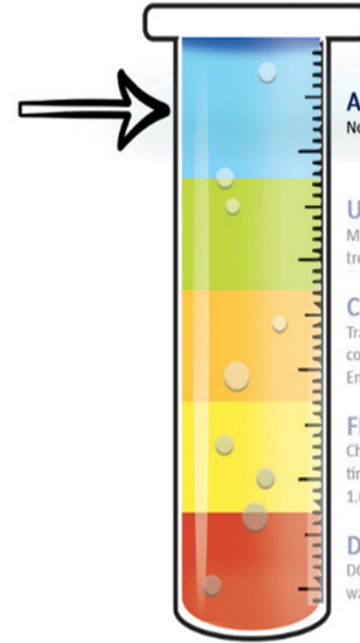
CUSTOMER RELATIONS RESPONSE

- **Pre-crisis:** Prepare messages ahead of time
 - Pre-load unpublished web pages at WaterOne.org
 - Establish rapport with local public health/medical community
- **During crisis:** Keep the public safe by informing/raising awareness
- **Post-crisis:** Recover trust with a clear, consistent “all clear” message



[Customer Service](#)[Your Water](#)[Community](#)[About Us](#)[Your Water](#)

Algae Risk Status - All Clear

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ALL CLEAR

No microcystin has been detected in the intake or tap water.

UNDER OBSERVATION

Microcystin has been detected in intake water, but our treatment process is completely removing any microcystin.

CAUTION

Traces of microcystin has been detected in tap water, but the concentration is low enough that an advisory is not necessary. Enhanced testing and treatment is underway.

FIVE AND UNDER - DO NOT DRINK

Children younger than 5 should NOT DRINK tap water at this time. Microcystin levels in tap water are between .3 ppb and 1.6 ppb.

DO NOT DRINK

DO NOT drink, boil, or use tap water for consumption in any way. Microcystin levels in tap water are in excess of 1.6 ppb.

At this time, our water status is ALL CLEAR. We do not detect any microcystin in our intake water.

Why are there reports about algal blooms in the area, but the water status still states "Clear?"

Harmful algal blooms may be found elsewhere in regional waterways, but there are none present in our intake where raw water begins the treatment process.

WaterOne regularly tests our intake water for microcystin and will continue to coordinate with the U.S. Geological Survey and KDHE to monitor area water conditions.

ABOUT HEALTH ADVISORIES

Health Advisories are non-regulatory values that serve as informal technical guidance to assist federal, state and local officials, and managers of public or community water systems to protect public health from contaminants. WaterOne Health Advisories are not legally enforceable federal standards and are subject to change as new information becomes available.

To learn more, see the [EPA Cyanotoxin Fact Sheet](#).

2018 MICROCYSTIN EVENT

- Received communication from Lawrence and Topeka - detections on 8/17.
- WaterOne had 4 detects from 8/16-8/19 on Kansas River
- Detections ranged from .177 ug/L to .537 ug/L
- No Visible Bloom on the River
- Had been over three years since last detects on the Kansas
- NO detections on the tap or through the Treatment Process

EOP RESPONSE TO 2018 EVENT

- Kansas Intake Shutdown as precaution
- Utilized Missouri River as primary water source
- Testing increased to daily with additional points
- Activated “Under Observation” status
- Adjusted Treatment
- Utilized Information from other resources: Lawrence, Topeka, USGS

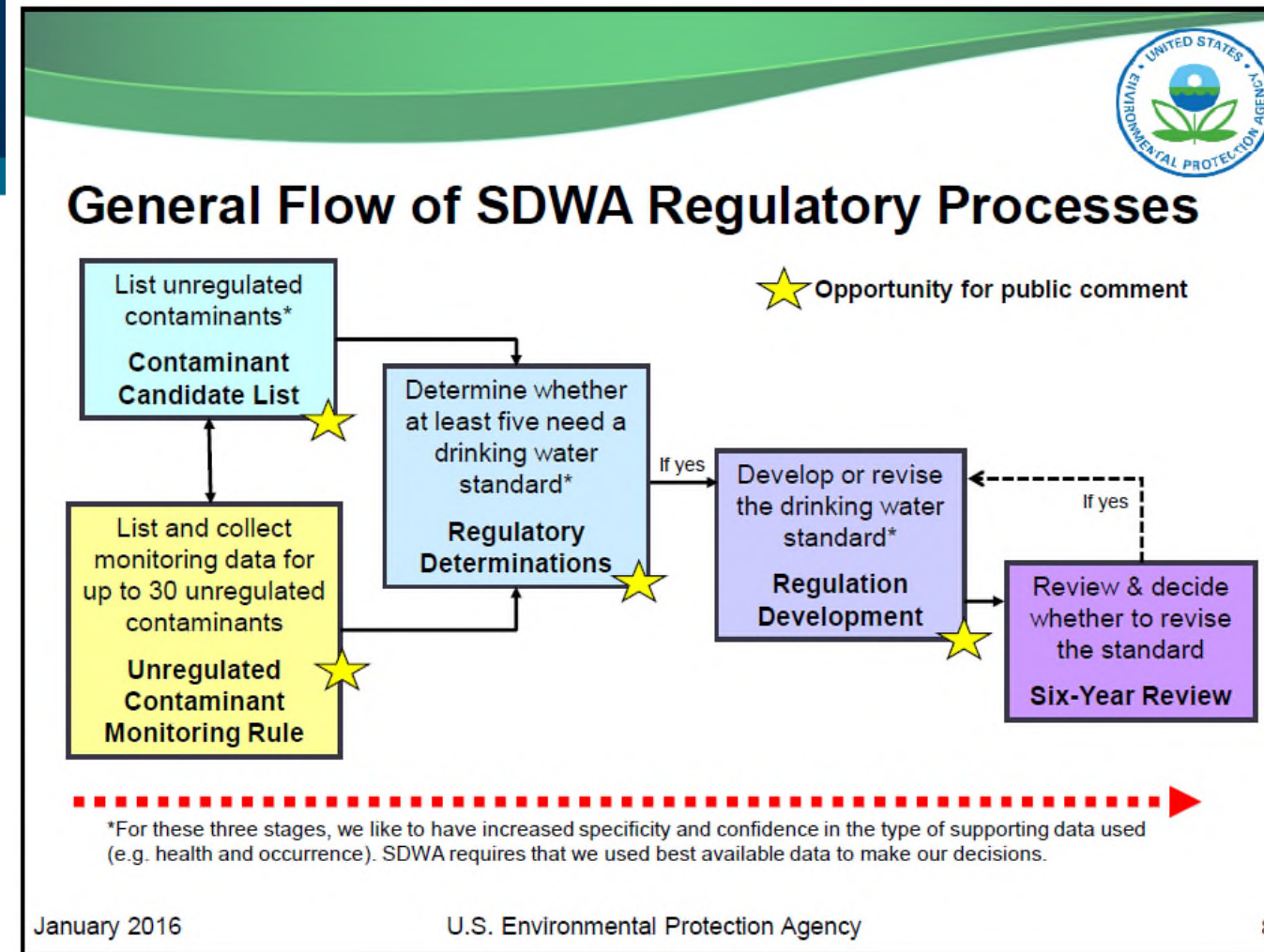


LESSONS LEARNED

- Reservoirs water quality can significantly impact Kansas River
- Utility ELISA Microcystin results used with USGS Data
- Collaboration is Key: USGS, KDHE, KWO, Utilities
- Plan for Public Communications



FUTURE REGULATION?



10 Cyanotoxins (Nine Cyanotoxins and One Cyanotoxin Group)

total microcystins	microcystin-LA	microcystin-RR	microcystin-LF	microcystin-YR
microcystin-LR	microcystin-LY	nodularin	cylindrospermopsin	anatoxin-a

BENEFITS OF OZONE

- Effective and proactive approach for reducing taste and odor compounds
- Effective at removal of algal toxins (microcystins)
- Effective at reducing micro-constituents (pharmaceuticals & personal care products)
- Simplifies operations by reducing required number of chemicals (Purate, sulfuric acid, powdered activated carbon and ferrous chloride)
- Reduces chlorine demand for maintaining a distribution residual





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04-18-2018

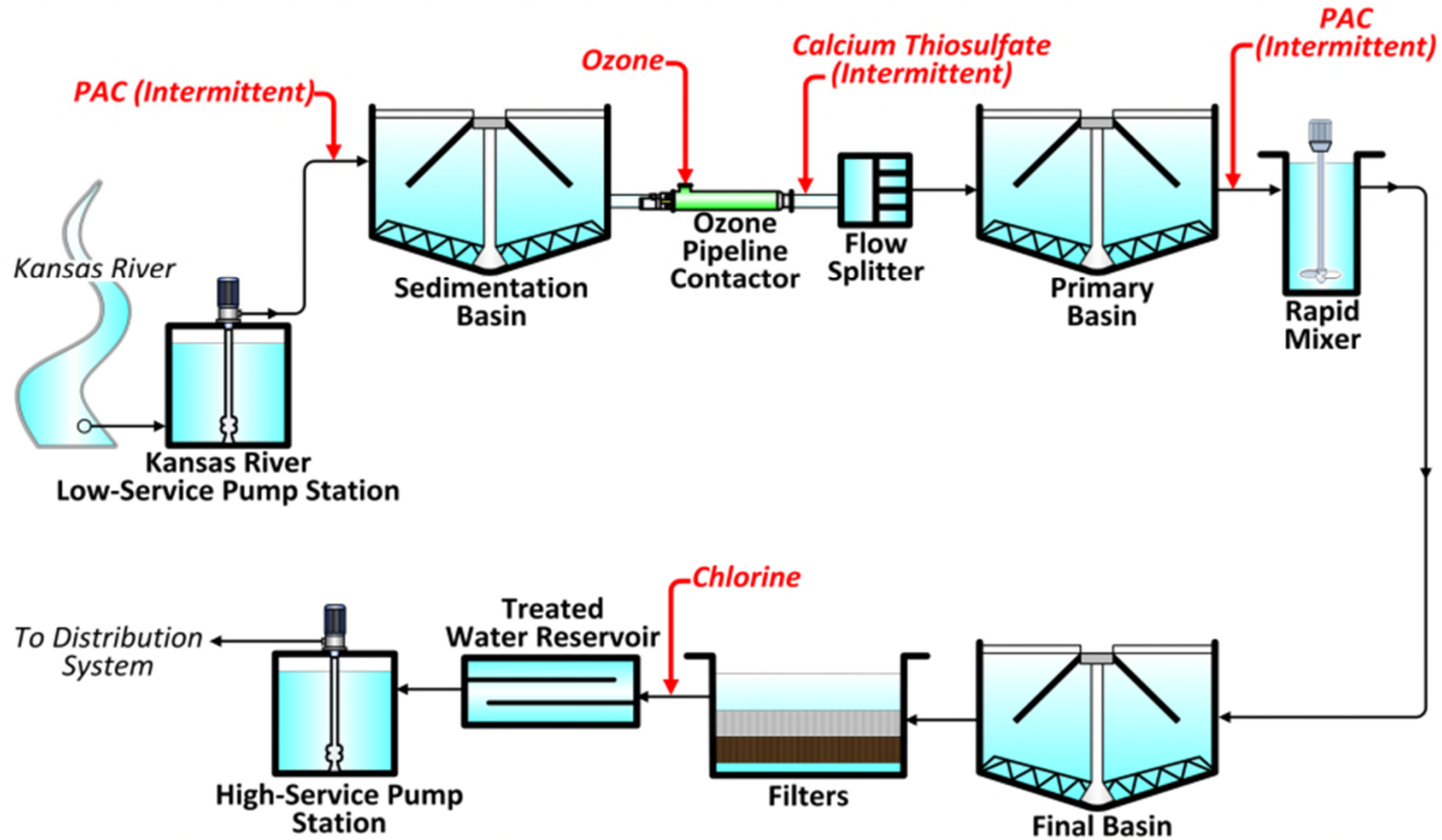
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COLLABORATION - USGS, WATER UTILITIES, AND THE KANSAS WATER OFFICE

- Testing included treated drinking water from the three utilities.
- Microcystin detected at all intakes, but not detected in treated drinking water.
- WaterOne used the data to make treatment decisions.



WATER TREATMENT PROCESS WITH OZONE



KANSAS RIVER STUDY OBJECTIVES

- Provide timely data to utilities for source-water supply
- Characterize the extent and duration of the transport
- Determine the strengths and weaknesses of the sampling plan
- Characterize sources, frequency & potential
- Develop models to provide real-time estimates



CONTINUOUS WATER-QUALITY MONITORS CAN BE USED TO DEVELOP MODELS TO COMPUTE POTENTIAL FOR GEOSMIN

